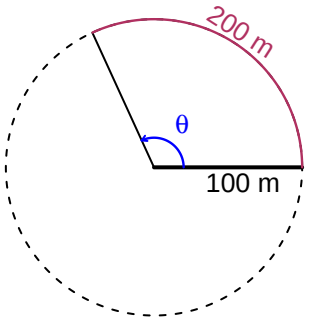
Name: Date:

Trig Final (SLTN v683)

- You can use a calculator (like Desmos)
- You should have a unit-circle with special angles and coordinates marked.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The arc length is 200 meters. The radius is 100 meters. What is the angle measure in radians?

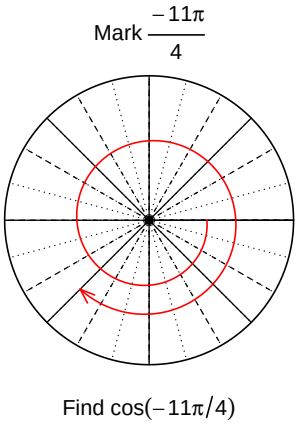


$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

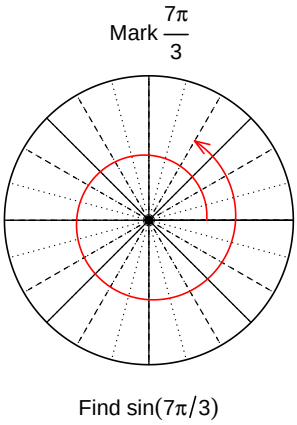
$\theta = 2$ radians.

Question 2

Consider angles $\frac{-11\pi}{4}$ and $\frac{7\pi}{3}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\cos\left(\frac{-11\pi}{4}\right)$ and $\sin\left(\frac{7\pi}{3}\right)$ by using a unit circle (provided separately).



Find $\cos(-11\pi/4)$



Find $\sin(7\pi/3)$

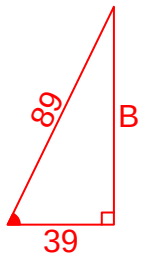
$\cos(-11\pi/4) = \frac{-\sqrt{2}}{2}$

$\sin(7\pi/3) = \frac{\sqrt{3}}{2}$

Question 3

If $\cos(\theta) = \frac{-39}{89}$, and θ is in quadrant II, determine an exact value for $\sin(\theta)$.

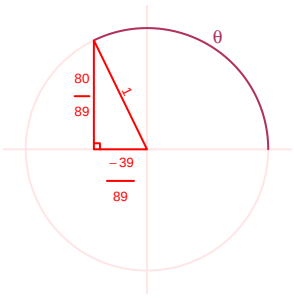
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$39^2 + B^2 = 89^2$$
$$B = \sqrt{89^2 - 39^2}$$
$$B = 80$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant II in a unit circle.



$$\sin(\theta) = \frac{80}{89}$$

Question 4

A mass-spring system oscillates vertically with a frequency of 5.48 Hz, a midline at $y = 6.8$ meters, and an amplitude of 3.19 meters. At $t = 0$, the mass is at the midline and moving down. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = -3.19\sin(2\pi 5.48t) + 6.8$$

or

$$y = -3.19\sin(10.96\pi t) + 6.8$$

or

$$y = -3.19\sin(34.43t) + 6.8$$